

REMARKS

Claims 1-12 are pending in this application. By this Amendment, claim 1 is amended and claims 13-22 are canceled. The amendments to the claims are supported in the specification in at least page 1, first paragraph, and page 13, fifth and sixth paragraphs, for example. No new matter is added. In view of at least the following remarks, reconsideration and allowance are respectfully requested.

Claims 1-9 and 11-12 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 3,395,027 (Klotz) in view of U.S. Patent No. 3,434,813 (Bomberger); and claim 10 is rejected under 35 U.S.C. §103(a) as being unpatentable over Klotz and Bomberger in view of U.S. Patent No. 5,803,990 (Mosser), U.S. Patent Application Publication No. 2002/0107133 (Trocynski) and U.S. Patent No. 3,857,717 (Wydra). These rejections are respectfully traversed.

The applied references fail to support an obviousness rejection because, even combined, they do not disclose or suggest "forming a diffusion barrier on a titanium alloy substrate" that is "configured to be used in corrosive environments at temperatures above 650°C," as recited in independent claim 1.

The Office Action cites Bomberger as allegedly disclosing that titanium-alloy articles are subject to deterioration by ocean spray at elevated temperatures. See Office Action at page 4. Therefore, the Office Action asserts that it would have been obvious to use the coating method described in Klotz on the titanium-based alloy described in Bomberger because Klotz "teaches a method of coating suitable for metals subject to deterioration in salt-containing environments and [Bomberger] teaches that titanium alloy is subject to deterioration in salt-containing environments at elevated temperatures." See Office Action at page 4.

However, Bomberger relates to a method of cladding titanium substrates with zinc sheets to protect the titanium-alloy article from corrosion, where the titanium-alloy article is subjected to moderately elevated temperatures, such as 500-900°F. See Bomberger at col. 1, lines 24-26. Thus, Bomberger only teaches that the titanium-alloy articles are subjected to temperatures of at most about 900°F, corresponding to about 482°C. Thus, the articles disclosed in Bomberger are subject to significantly lower temperatures than the articles that are the subject of the claimed method.

In particular, as described in the specification at page 1, paragraphs 1-4, when titanium alloy substrates are subjected to high temperatures (e.g., above about 650°C), the damaging effects of alpha-case oxide formation damages the substrate. See also specification at page 7 which states "titanium alloys are known to be generally susceptible to oxidation damage through the formation of the so-called alpha-case oxide layer." Bomberger does not disclose or suggest protecting titanium alloy substrates against alpha-case oxidation damage, particularly in the claimed temperature range of about 650°C.

Furthermore, the obviousness rejection is improper because the Office Action fails to establish that combining the method of Klotz with the substrate in Bomberger would have a reasonable expectation of success. See MPEP §2143.02. For example, Klotz discloses a method of coating substrates such as magnesium, aluminum, ferrous-based metals, ceramics, and plastics with an anti-corrosive coating. See Klotz at col. 1, lines 19-30. Klotz does not remotely suggest to coat titanium alloy substrates with its anti-corrosive coating.

In this regard, a person of ordinary skill in the art would not have reasonably expected a coating for substrates such as magnesium to have been effective as an anti-corrosive coating for titanium alloy substrates, particularly in view of the unique problems associated with coating titanium alloy substrates. As described in the specification at page 14, fifth paragraph, titanium alloy substrates that are coated with metallic-based coatings were known

to cause fatigue damage because the metals diffuse into the titanium alloy substrate. It was also known that some oxygen diffusion barrier components would react with titanium in the temperature range in which the substrate was intended to operate. See specification at page 14, third paragraph. Finally, some coatings (e.g. aluminum coatings) were known not to react with the titanium alloy substrate at elevated temperatures. However, these coatings became brittle and caused fatigue damage to the surface of the titanium substrate, thereby increasing the chances that the substrate would fail. See specification at page 14, fourth paragraph.

It is worth noting that Bomberger, which is cited as allegedly disclosing that titanium-alloy articles corrode when subjected to moderately elevated temperatures, prevents such corrosion by applying a zinc sheet to the titanium alloy substrate, and not by applying a ceramic-forming metal oxide. Thus, the art of record fails to establish that one could provide a suitable metal oxide based anticorrosive coating on a titanium alloy substrate with a reasonable expectation of success.

Finally, the combination claimed in claim 1 exhibits surprising results, because the coating combines with oxides that are formed on the surface of the titanium alloy, which considerably reduces the extent to which the oxygen diffuses into the titanium alloy. See specification, at page 14, second paragraph. This result is not taught or suggested in Klotz or Bomberger. Accordingly, for all of the above reasons, claim 1 is patentable over the applied references.

Claims 2-12 depend from claim 1 and are therefore also patentable over the applied references for at least the reasons enumerated above, as well as for the additional features they recite.

Accordingly, withdrawal of the rejections is respectfully requested.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-12 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,


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